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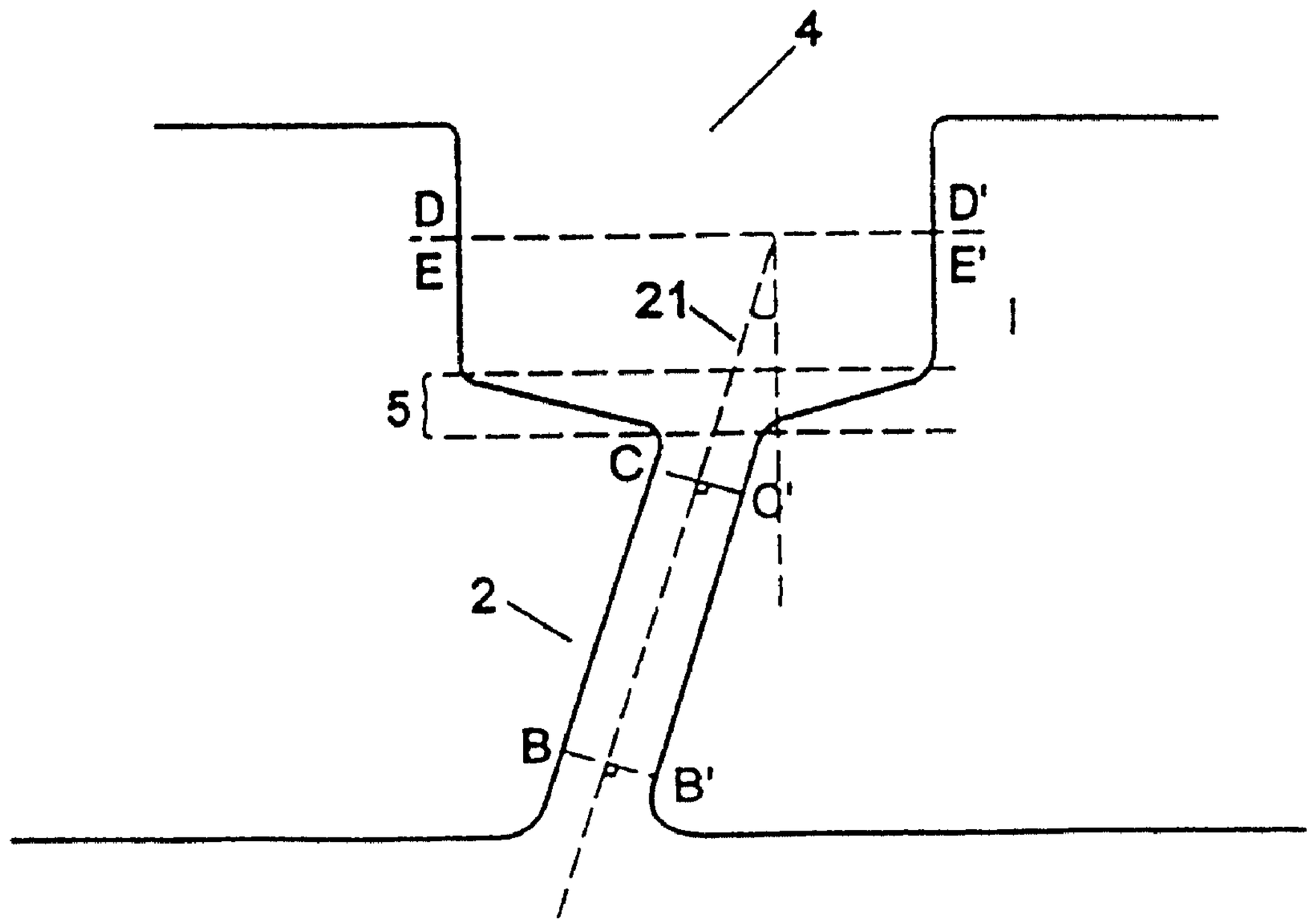


(57) Abrégé/Abstract:
The invention concerns a central hauling pool (1) e.g. for a fishing vessel, with the central hauling pool (1) constituting a generally vertical main tube (2) through the vessel, with a free lower opening or mouth (8) towards the sea and a free upper opening (4) towards the atmosphere. The novel and characterizing feature of the invention is that the upper part of the main tube (2) has a tube transition (5) constituting a large relative widening of the cross section area below the water line in the main tube (2) to an upper tube part (3). The effect of such a widening of the upper part of the central hauling pool is that the oscillations of the water surface are damped considerably as compared to the heave of the ship and the waves of the sea.

ABSTRACT

The invention concerns a central hauling pool (1) e.g. for a fishing vessel, with the central hauling pool (1) constituting a generally vertical main tube (2) through the vessel, with a free lower opening or mouth (8) towards the sea and a free upper opening (4) towards the atmosphere. The novel and characterizing feature of the invention is that the upper part of the main tube (2) has a tube transition (5) constituting a large relative widening of the cross section area below the water line in the main tube (2) to an upper tube part (3). The effect of such a widening of the upper part of the central hauling pool is that the oscillations of the water surface are damped considerably as compared to the heave of the ship and the waves of the sea.

CENTRAL HAULING POOL

The invention concerns a central hauling pool, for instance arranged in a fishing vessel. The central hauling pool is used for setting out fishing tackle and hauling fishing tackle and catch. The central hauling pool may also be used for other equipment for use in the sea.

On fishing vessels, such as a vessel for long-line fishing, the long-line with the catch is usually hauled through hatches in the ship's side near the bow of the vessel, above the waterline. In some instances, the long-line is hauled over the deck, but this has real disadvantages due to wind and weather. The vessel approaches the long-line, i.e. the line is hauled generally from the bow so that the long-line comes in with a slightly rearwardly inclined angle between 10 and 20 degrees from the vertical line. Experience shows that this is the best way of hauling the line. A single hull vessel will always have a resonance period for its heave motion, and one will normally experience some heave motion in the vessel during normal operation. The most frequently occurring wind states off the Norwegian coast are wind forces between a fresh breeze and a near gale, with corresponding sea states. When the catch is hauled through hatches situated ahead on the ship's side, there is a risk of losing some of the catch (fish falling off the long-line as the fish are hauled out of the sea). This may be due to several causes, e.g. the buoyancy of the fish in the sea ceases to have effect and the whole weight of the fish overloads the hook, or spray from vessel knocks the fish off the hook, or the fish is knocked by seas independent of the vessel, or vessel heave, etc.

One possible solution to avoid the waves is to haul the long-line through a so-called "dragerbrönn"; a long-line hauling pool, an essentially tubular vertical aperture in the fishing vessel, with the main part of the tube open at its lower end towards the sea, and open at its upper end towards the free air or a room in the ship. Such a central hauling pool gives considerably improved working

conditions for the man working at the rail roller who can now avoid standing exposed. The man working by the rail roller must be present by the central hauling pool to guide the fish over the rail roller and into the crucifier (the device removing the fish from the hook) section of the vessel, and, not least, to catch fish that have fallen off the line. However, with a solution like this, one problem arises in that such a vertical tube will have a standing water column with a resonance period which may correspond with the vessel's heave resonance period. Thus the water surface inside the central hauling pool will come to swing with large amplitudes as the fishing vessel heaves, or with the same period and amplitude as the waves of the sea, due to the pressure variations of the waves. It is also possible that the amplitude is amplified inside the central hauling pool. This may lead to loss of fish inside the central hauling pool in the same way as by ordinary fishing, and would also be a risk to the crew handling the long-line and the catch under deck. Wave damping devices may be arranged inside the central hauling pool. However these wave damping devices hinder the ordinary use of fishing tackle. Both fish and hooks may be caught up or impeded by them. Additionally, the view can be reduced due to foaming.

US-patent 4 176 614 describes one possible solution is to change the resonance period of the central hauling pool by closing it against the free air. The American solution may be useful if one performs operations with wireline or drillstring through the central hauling pool, but it is not possible to haul fish through an air tight or almost air tight opening around a line. Further, the pressure variations in such an air tight chamber would be harmful to the crew (the man working at the rail roller). US 4 176 614 describes that the central hauling pool may be pressurized or under pressure in order to change the resonance period of the water column, partly in that the air chamber acts as an air spring with higher or lower pressure, partly in that the length of the water column would be changed to longer or shorter height.

US-patent 4 452 165 provides a solution by arranging or building large tanks into semisubmersible platforms. The tanks have the waterline standing inside, with apertures to free air at the top and to the free sea at the bottom, via channels with considerably smaller cross-section than the tanks.

One purpose of this invention is to extend the resonance period of the water column in the central hauling pool to become much longer than the resonance period of the vessel, and also to ensure that it does not coincide with the periods of the dominating sea wave amplitudes.

Another purpose of the invention is to reduce the wave amplitude in the central hauling pool both in consideration of the crew's working conditions, and to reduce the risk of losing catch as a result of tossing currents.

A third purpose of the invention is to transfer the hauling of the long-line-catch to a sheltered place inside the long-line fishing vessel.

Mathematical modelling and scale model experiments has shown that the solution to the problems with fishing vessels as mentioned above, and which has been incompletely solved by the known art, is a central hauling pool in the fishing vessel, with the central hauling pool constituting an essentially vertical main tube through the fishing vessel, with a free lower opening or mouth towards the sea and a free upper opening towards the atmosphere. The new and characterizing trait of the invention is that the upper part has a tube transition comprising a large relative widening of the cross-section area under the waterline inside the main tube under the waterline, to an upper tube part.

The invention therefore provides a central hauling pool for a vessel having a waterline comprising a main tube having an upstanding main axis running through the vessel with a lower submarine opening and an upper opening to the atmosphere wherein the main tube comprises a lower tube part connected to an upper tube part through a tube transition zone, said tube transition zone being

below the waterline of the vessel and said lower tube part being smaller cross-sectional area than said upper tube part.

In preferred embodiments, the main tube may be elliptical, and from fishing considerations may be inclined slightly rearwards with respect to the vertical line, so that the lower mouth is situated astern of the upper mouth of the main tube. In particular preferred embodiments the main axis deviates between 0 and 30 degrees, preferably between 10 and 20 degrees and especially between 16 and 18 degrees from the vertical.

Below, a short description of the drawings is given.

Fig. 1 displays a vertical section of a vessel with a central hauling pool according to the main idea of the invention.

Fig. 2 shows a vertical longitudinal section through a part of the vessel's hull, a principally preferred embodiment of the invention.

Figs. 2b and 2c show cross-sections of the lower tube part of Fig. 2 at B-B and C-C' respectively. Figs. 2d and 2e show alternative possible embodiments of cross-sections of the upper tube part of
Fig. 2 at D-D' and E-E' respectively.

Fig. 3 shows a vertical section of the central hauling pool with a scuttle for adjustment of the upper cross-section and inclination angle of the bottom of the ream or expanding part of the central hauling pool.

Fig. 4 shows a horizontal cross-section of the upper part of the central hauling pool and the location of the rail roller and the man working by the rail roller, with respect to the main tube of the central hauling pool.

Fig. 5 shows, in a Cartesian coordinate system, the relation between the behaviour of the water surface and the wave height (level/wave height) with and without this invention.

The central hauling pool 1 is, in a preferred embodiment, arranged somewhat astern of midship due to the heave (vertical) motion being at least there. Figure 1 shows the principle for the

central hauling pool 1 itself with an essentially vertical main tube or duct 2. A tube transition 5 constitutes the connection between the main tube 2 and a widened upper tube part 3 of the central hauling pool 1. The tube transition 5 may be straight, horizontal or funnel-shaped.

Figure 2 shows that the main axis 21 of the main tube 2 may be slightly inclined towards the stern, with a lower mouth 8 towards the sea arranged somewhat astern of the upper mouth 10. Experience shows that it is practical to go towards, but slightly over the line, so that the line is hauled from the astern direction with an angle deviating approximately 17 degrees from the vertical line. It is possible to control the speed and course of the vessel in order for the long-line to enter approximately in centre of the main tube 2.

Figure 2b and c shows cross-sections of the main tube 2 by the lower mouth 8 and the upper mouth 10, respectively. In a preferred embodiment of the invention the main tube 2 is elliptical with the long half-axis of the ellipse essentially along the vessel, and the length of the long half axis about 1 metre, and with the smaller half-axis length about 0.75 metre. Other ellipse shapes may be used within the axis relations 1:1 (circular tube 2) and 3:1 (sideways flattened tube 2).

Figures 2d and 3 shows possible horizontal sections of the widened tube part 3.

Figure 1 shows the tube transitions 5 with a funnel shape. In Figure 3 a scuttle 30 is drawn, pivoted on a hinge 32 arranged near the upper mouth 10 of the main tube 2, reaching into the upper tube part 3. By rotating this plate away from the bottom of the tube transition 5 where the hinge 32 is arranged, one can change the effective area of the water surface of the upper tube part 3. Thus one can reduce the resonance period of the water column in the central hauling pool 1. This may be useful if the vessel should be exposed to large seas of the same long period as the resonance period of the central hauling pool according to the invention.

Figure 3 also displays the preferred path for the long-line during the hauling of the catch. To keep the advantageous angle of 17 degrees with respect to the vertical, the main tube 2 has been given this angle with the vertical. Other angles may be more appropriate if it should show e.g. to be possible to increase the vessel's speed during hauling.

Figure 4 displays a horizontal cross-section of the upper part 3 of the central hauling pool 1, with a man working at the rail roller, situated on a shelf by the rail roller 15 where the long-line is to pass inside to the crucifier section.

Figure 5 shows in a Cartesian coordinate system a generalized amplitude-wave spectrum for the waves inside a central hauling pool 1. The graphs show that a central hauling pool without an upper widened part may have a wave spectrum with large amplitudes with periods about 5-6 seconds, which may be resonance frequency of the ship, or as for the waves outside the ship, but with the invention these amplitude tops are damped and displaced outwards towards longer wavelengths, out of the region of the vessel's resonance period.

An explanation of how the invention works is as follows. Firstly the area of the water is expanded in the upper part of the central hauling pool, so that a large volume must pass through the lower narrower part of the main tube in order to slightly displace the water surface of the upper expanded part. Secondly turbulence arises in the tube transition part 5. The turbulence may lead to dissipation of energy and finally to a weak heating of the water, practically undetectable. In addition the resonance period of the central hauling pool 1 will be extended considerably when it is widened in the upper part to a larger area below the waterline. Additional damping of the wave amplitude can be achieved by closing the air column's upper part towards the atmosphere, but this is not recommended in consideration of the fishermen's health.

The invention is intended for fishing vessels. It may be advantageous to use the invention in connection with hauling of

fishing nets, thus with another angle or direction of the axis of the main tube 2 with respect to the vertical line. However it is possible to use the invention in connection with other marine operations, e.g. oil drilling or oil production by means of single hulled vessels, where calm sea conditions in the central hauling pool would be advantageous. Further examples include oceanographic vessels with transducers arranged on a cable, seismic exploration vessels with seismic streamers which are launched and hauled, ordinary vessels which drop or lift their anchors, and generally any vessel that usually sets and hauled equipment from the sea whether the vessel is stationary or moving in the sea, and where there may be an advantage in having calm conditions in the sea space where the equipment is handled at the sea surface.

CLAIMS:

1. A central hauling pool for a vessel having a waterline, said vessel comprising a main tube running through the vessel with a lower submarine opening and an upper opening to the atmosphere wherein the main tube comprises a lower tube part having a generally steeply inclined main axis connected to an upper tube part through a tube transition zone, said tube transition zone being below the waterline of the vessel and said lower tube part having a smaller cross-sectional area than said upper tube part.

2. The central hauling pool according to claim 1, wherein said main axis of said main tube is angled to the vertical axis so that the lower submarine opening is displaced aftwards or forward with respect to the free upper opening.

3. The central hauling pool according to claim 2, wherein said lower tube part is angled to the vertical axis and said upper tube part is substantially vertical.

4. The central hauling pool according to claim 2 or claim 3, wherein the main axis deviates between 0 and 30 degrees from the vertical.

5. The central hauling pool according to any one of claims 2 to 4, wherein the main axis deviates between 10 and 20 degrees from the vertical.

6. The central hauling pool according to any one of claims 2 to 5, wherein the main axis deviates between 16 and 18 degrees from the vertical.

7. The central hauling pool according to any one of claims 1 to 6, wherein the lower tube part has an elliptical cross-section normal to the main axis and the ratio of the semi-major axis and the semi-minor axis of the ellipse is between 1:1 and 3:1.

8. The central hauling pool according to claim 7, wherein the lower opening has an elliptical semi-major axis of approximately 1 metre generally oriented along the main axis of the vessel, and a semi-minor axis of approximately 0.75 metre.

9. The central hauling pool according to claim 7, wherein the lower tube part comprises an upper opening into the tube transition zone, said lower tube part upper opening having an upper semi-major axis of about 1 metre generally oriented along the main axis of the vessel, and a semi-minor axis of approximately 0.75 metre.

10. The central hauling pool according to any one of claims 1 to 9, wherein the tube transition zone is funnel-shaped.

11. The central hauling pool according to any one of claims 1 to 9, wherein the tube transition zone is generally straight or horizontal.

12. The central hauling pool according to claim 9, additionally comprising a plate or scuttle pivotally mounted in the tube transition zone proximate to said upper opening of the lower tube part.

13. The central hauling pool according to claim 10, further comprising a plate or scuttle pivotally mounted in the tube transition zone proximate to said upper opening of the lower tube part.

14. The central hauling pool according to any one of claims 1 to 13, wherein widening of the cross-sectional area of the lower tube part to the upper tube part leads to a resonance period for water in the central hauling pool which is considerably longer than the resonance period for vertical heave motion of the vessel.

15. The central hauling pool according to claim 1, wherein the cross-section area of the lower tube part increases or decreases between the lower submarine opening and an upper opening of said lower tube part.

16. The central hauling pool according to any one of claims 1 to 15, wherein the upper tube part is of a generally rectangular horizontal cross-section.

17. The central hauling pool according to any one of claims 1 to 15, wherein the upper tube part is generally elliptical in horizontal cross-section.

18. The central hauling pool according to any one of claims 1 to 13, wherein said upper tube part has an adjustable free surface area so that the resonance period of a water column in the central hauling pool does not correspond with the resonance period of the vessel or with a dominating amplitude period of waves of water in which said vessel floats.

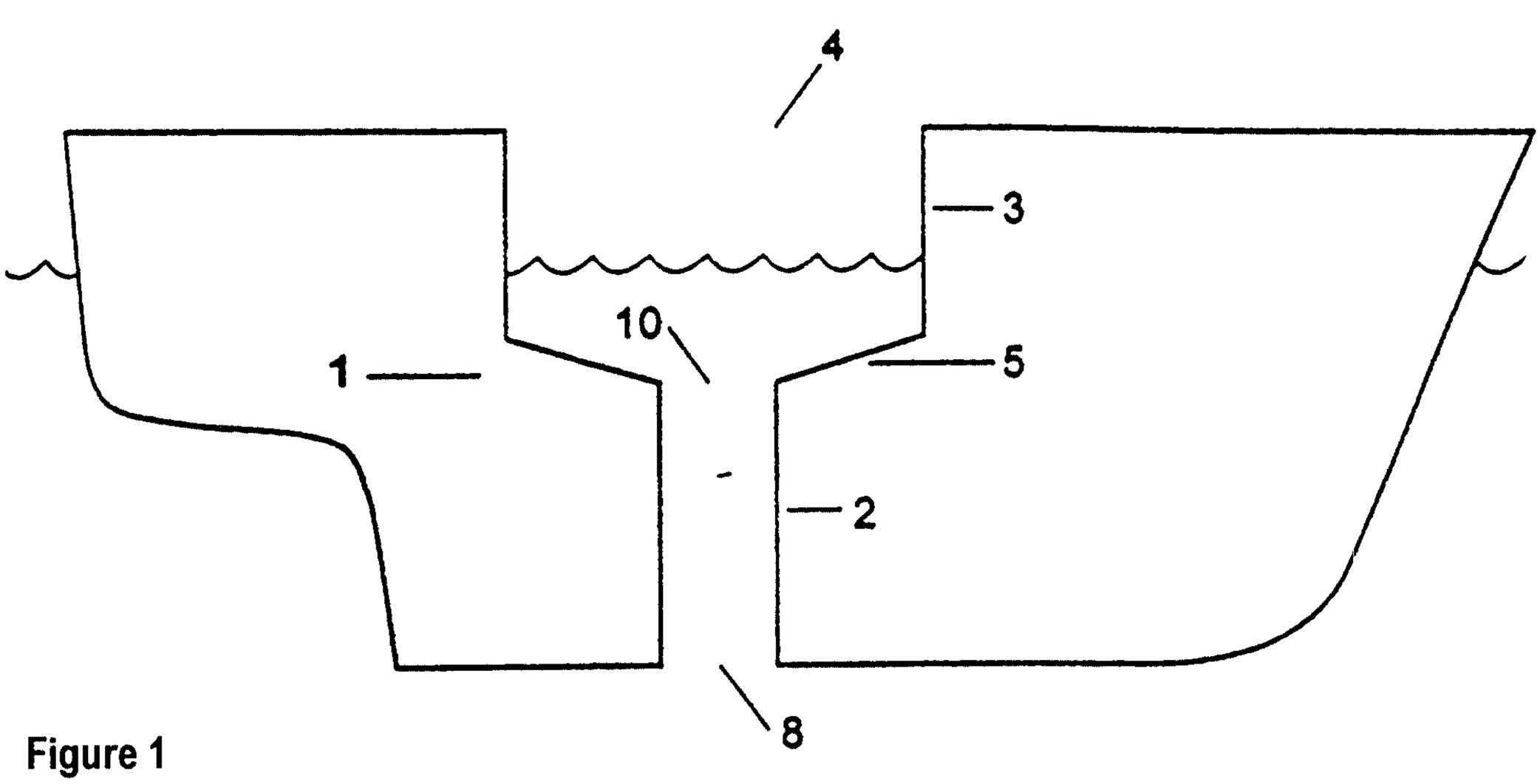


Figure 1

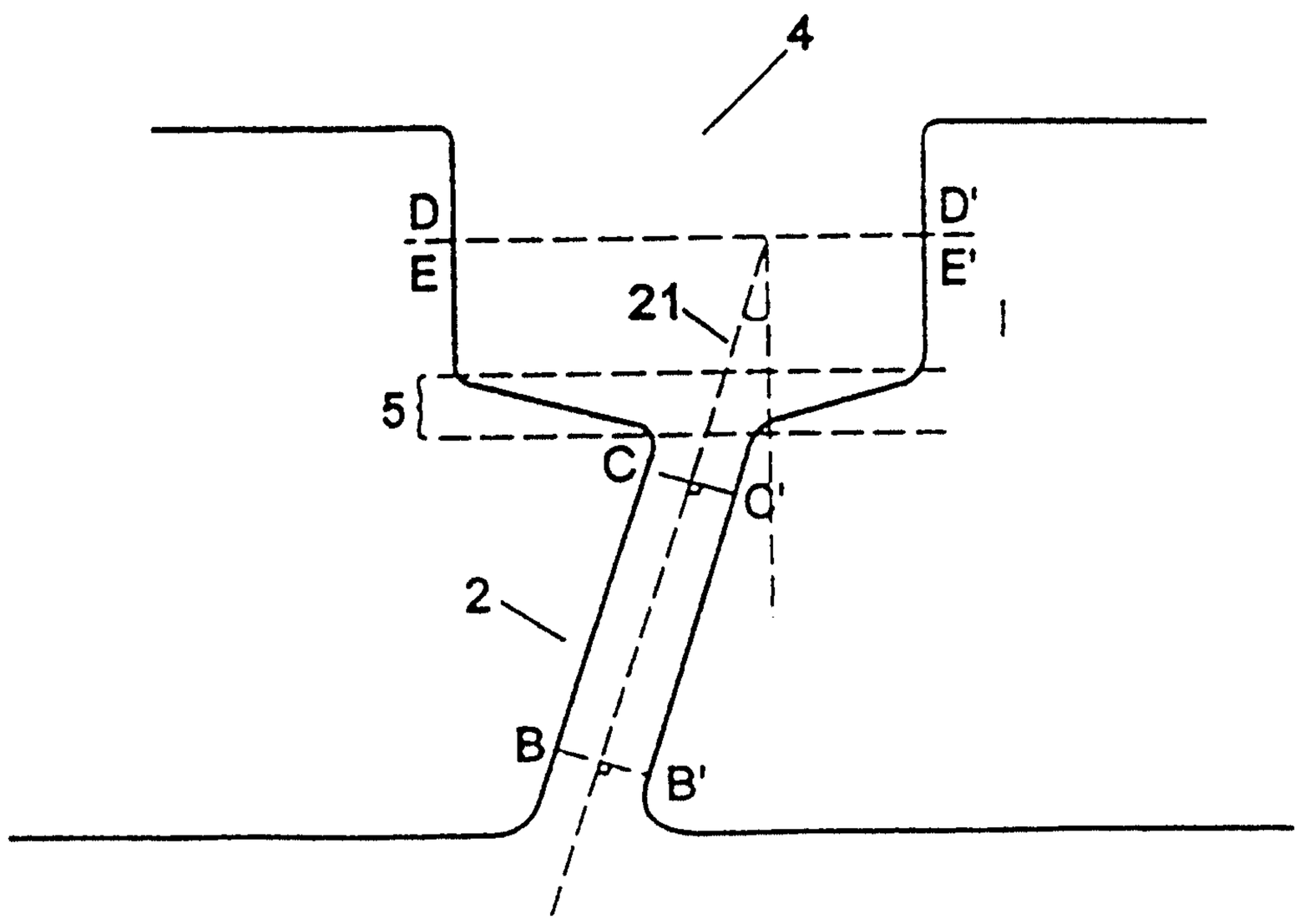


Figure 2

Fig. 2b

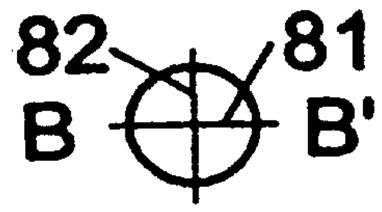


Fig. 2c

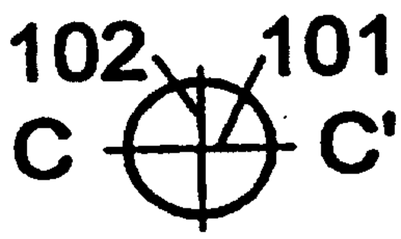


Fig. 2d

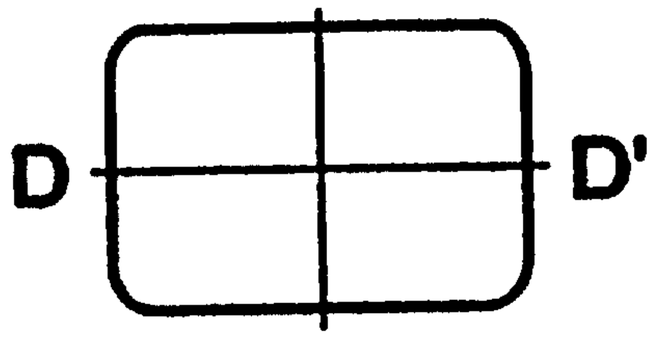
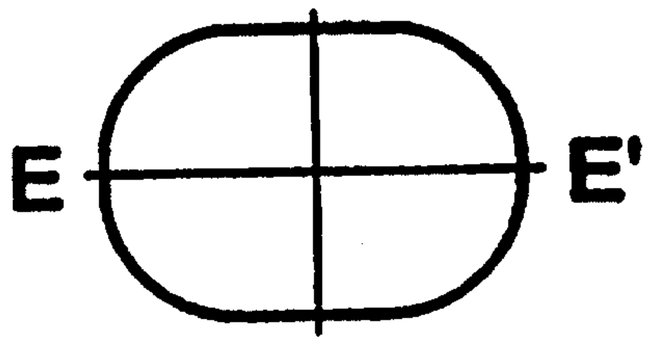


Fig. 2e



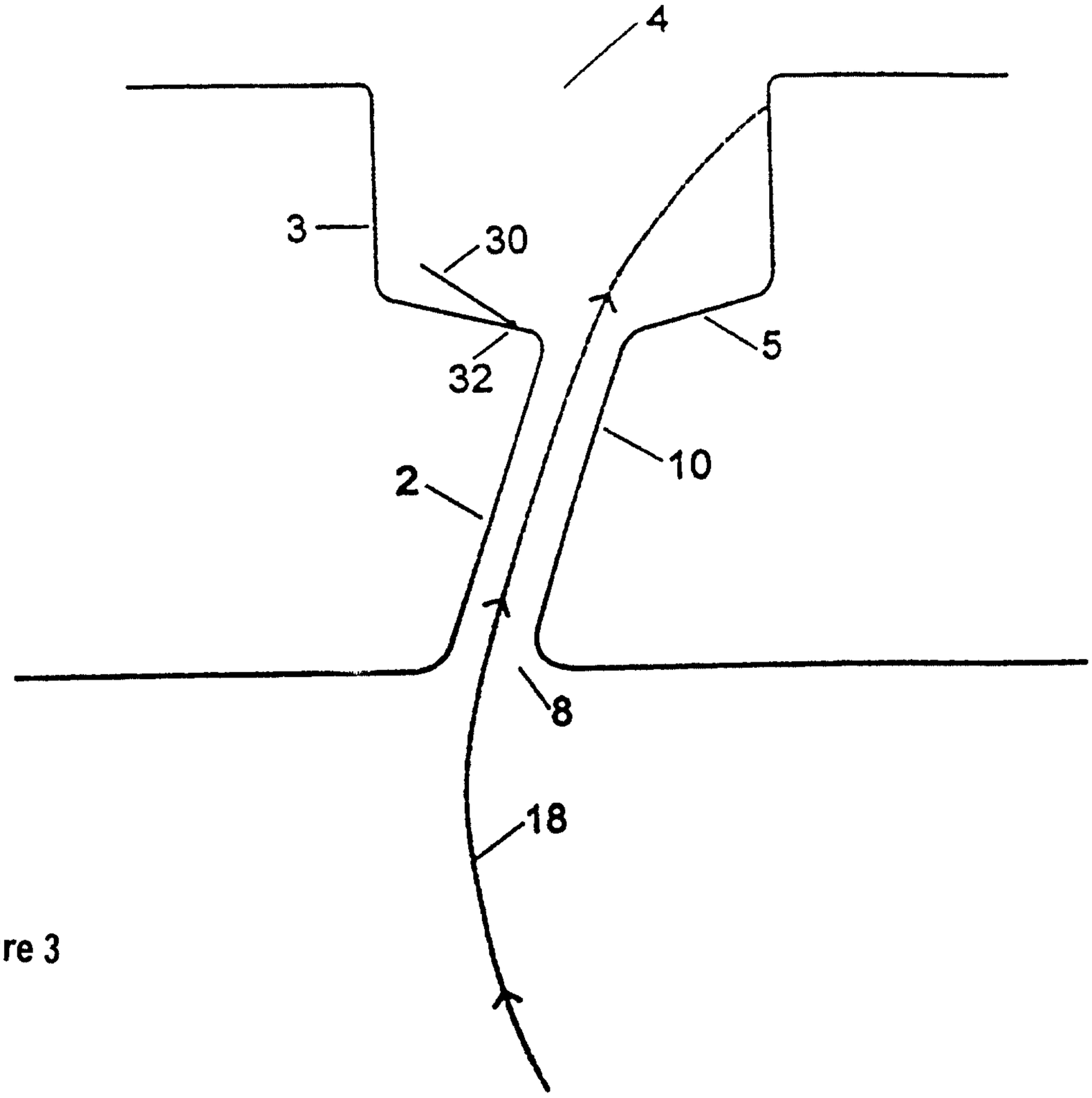


Figure 3

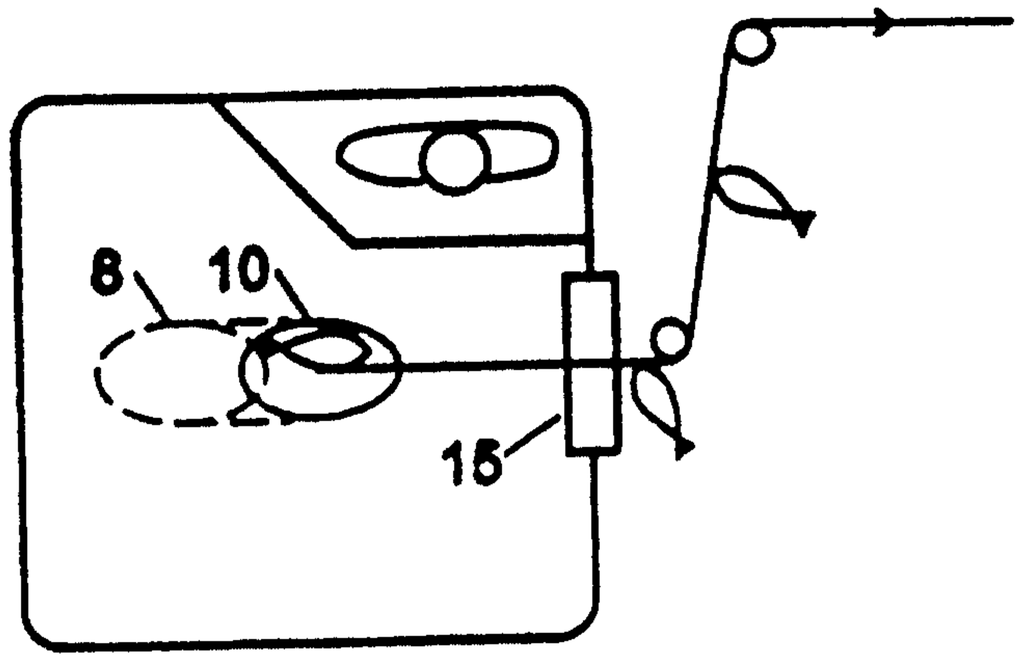


Figure 4

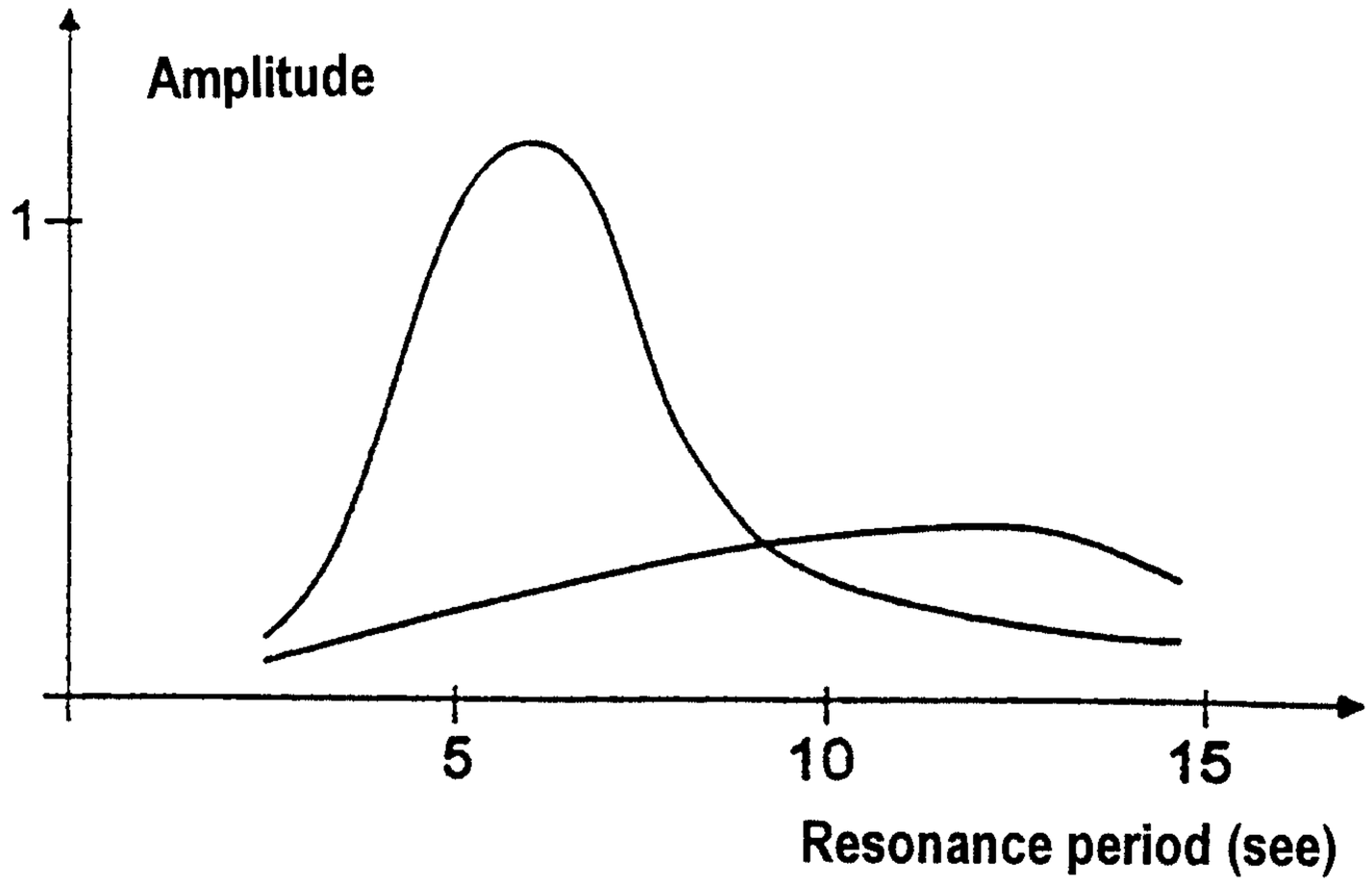
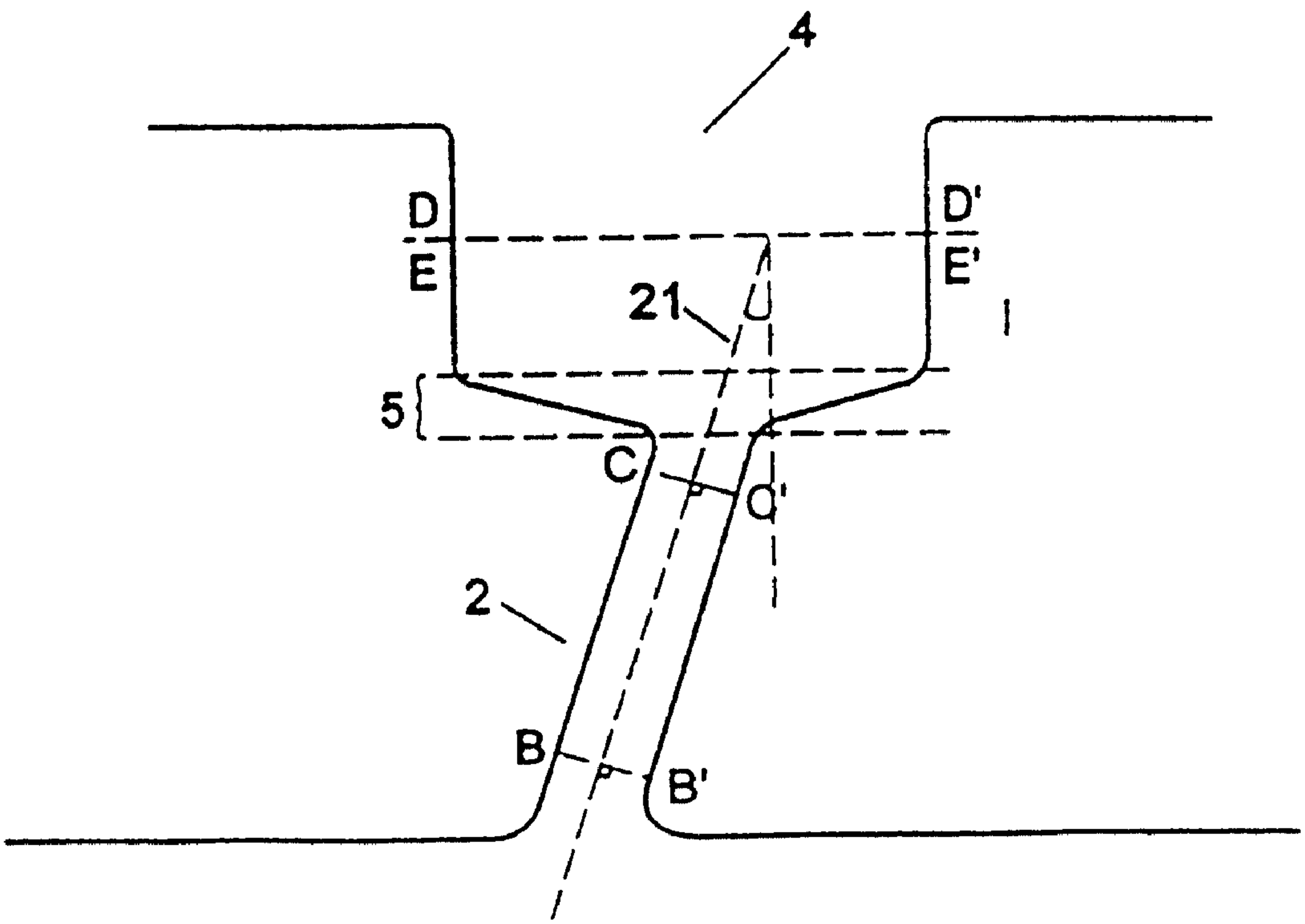


Figure 5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